Robotics – Exercise 2 – Report

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Summery

In this report we'll explain our coverage algorithm and report its success. Generally, the algorithm let the robot wander around randomly in strait lines until most of the arena is covered.

Algorithm Description

Explanation: The algorithm let the robot drive at full speed until one of its front bumpers pressed, and then stop and change driving angle by turning in a random speed (and direction) for a random time (up to 3 seconds), and then drive again and so on.

General Pseudo-Code:
1. Drive until hit an obstacle.
2. Change driving angle randomly.
3. Back to 1.

Loop Function Pseudo-Code:
1. if timer stopped:
    a. if not bumped:
        1) drive at full speed.
    b. else:
        1) set random angular speed and rotation time.
        2) set timer and start it.
2. else:
    a. turn (with an angular speed set in 1.b.1).

Note: We inferred that it doesn't matter if one of the other bumpers pressed because the driving is forward. We found that the rear bumpers never pressed, but sometimes the right or the left bumpers are pressed. We decided to ignore side presses because the driving is forward so we can save turnings.
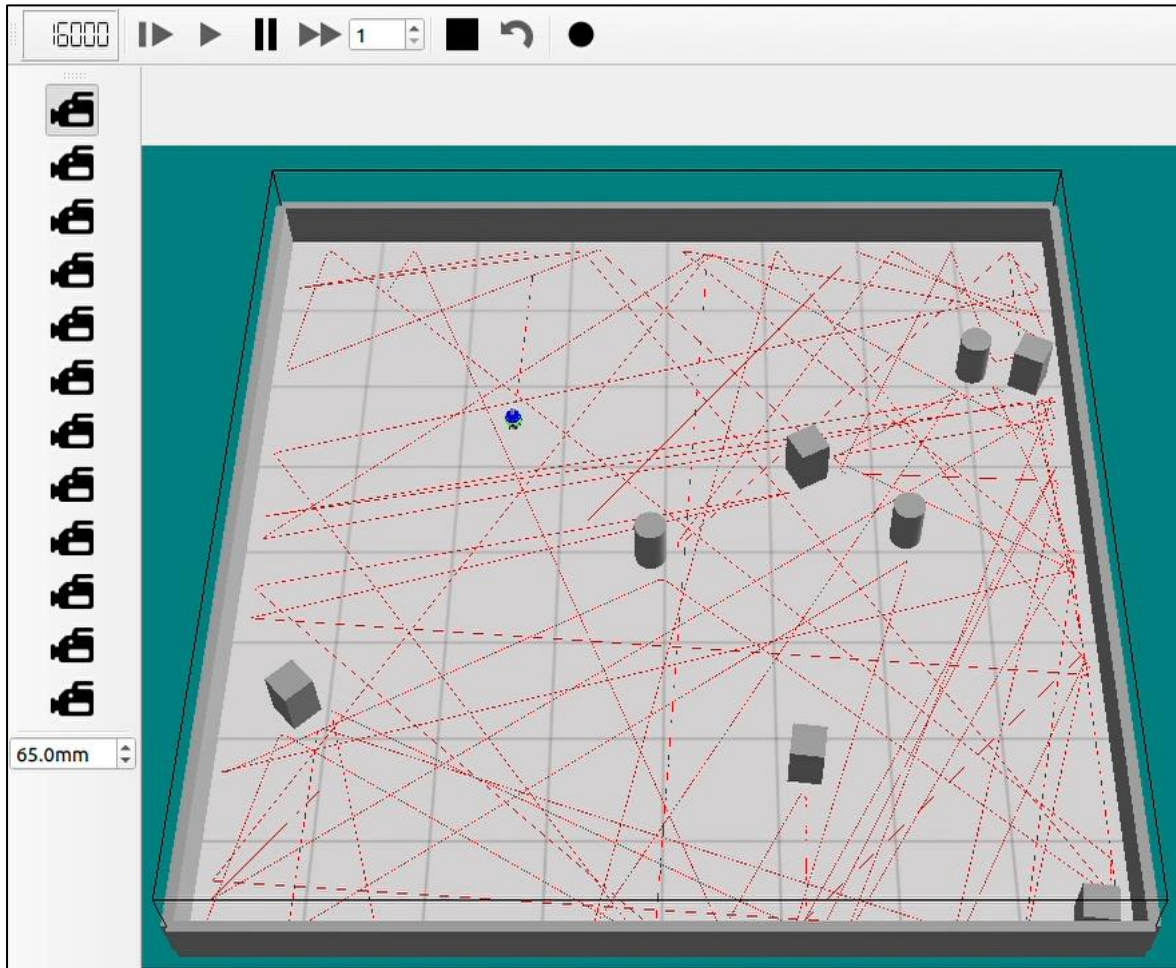
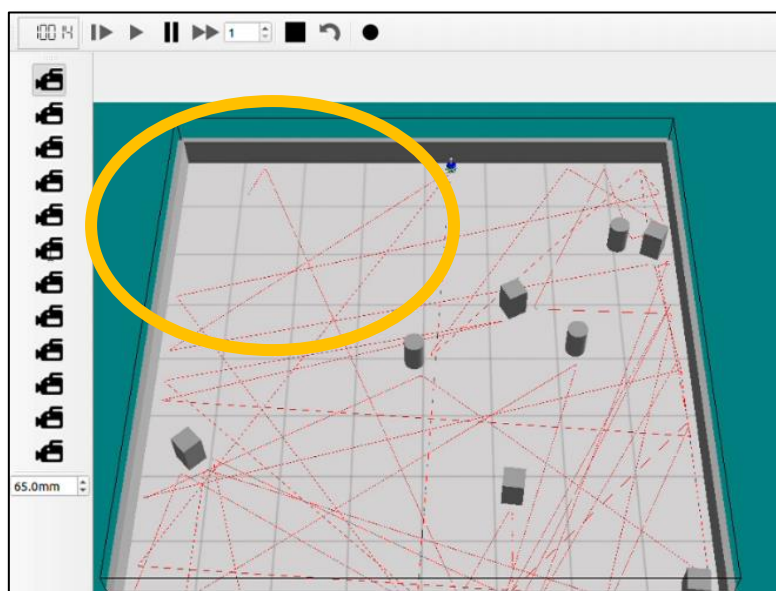# Success Report for $random\_seed = 1$

<u>End Clock-Ticks</u>: 16,000.

<u>End Screenshot</u>:

<u>Comment</u>: This result is nice, but not very satisfies because in 10,000 clock-ticks the arena was fairly covered except from the upper-left part of the arena. That is happening because of the concentration of obstacles in the rest of the arena.
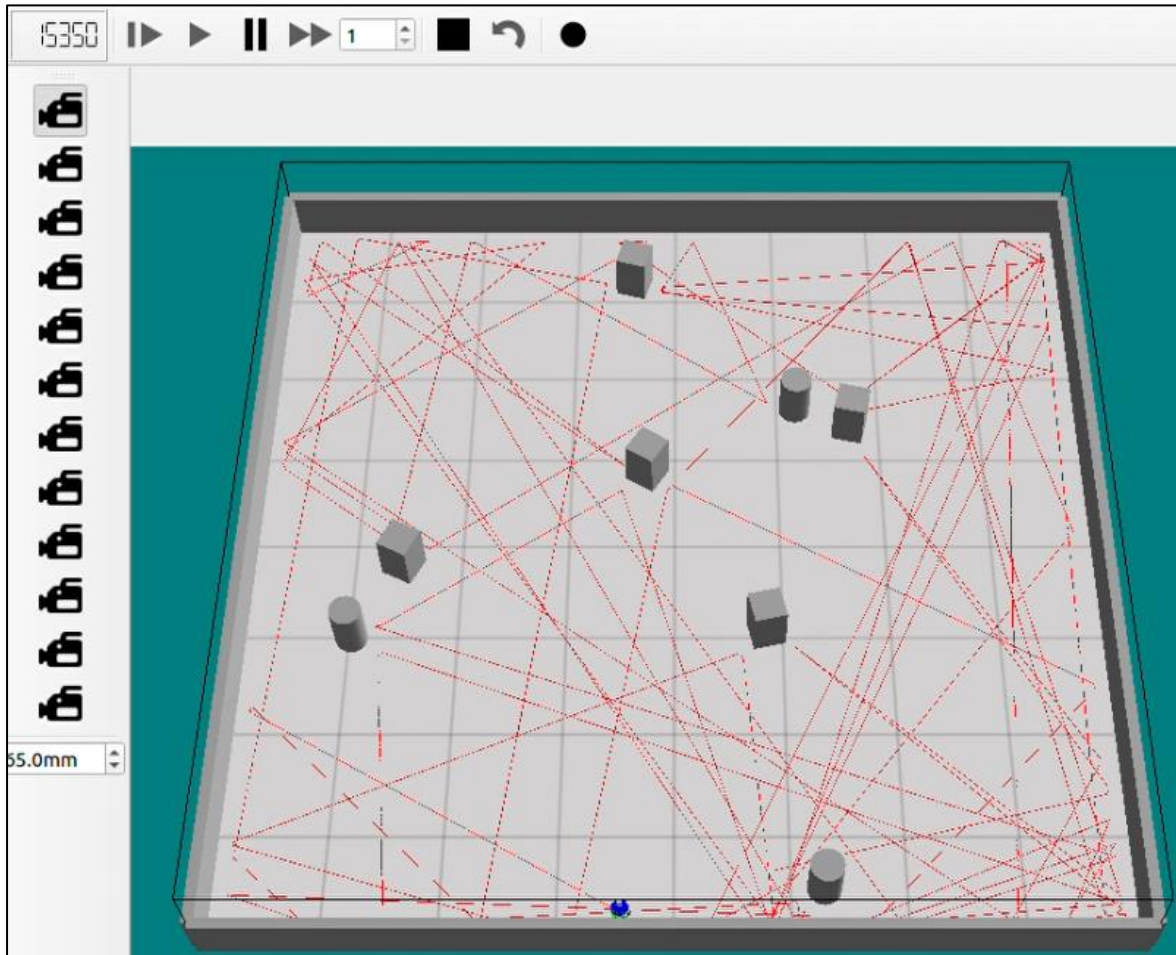
Here is a screenshot at 10,014 clock ticks:

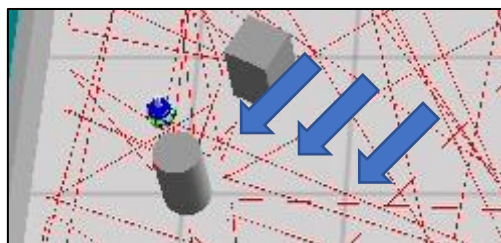# Success Report for $random\_seed = 2$

End Clock-Ticks: 15,350.

End Screenshot:

Comment: This result is pretty satisfying enough because the arena is fairly covered in less clock-ticks then the previous experiment.
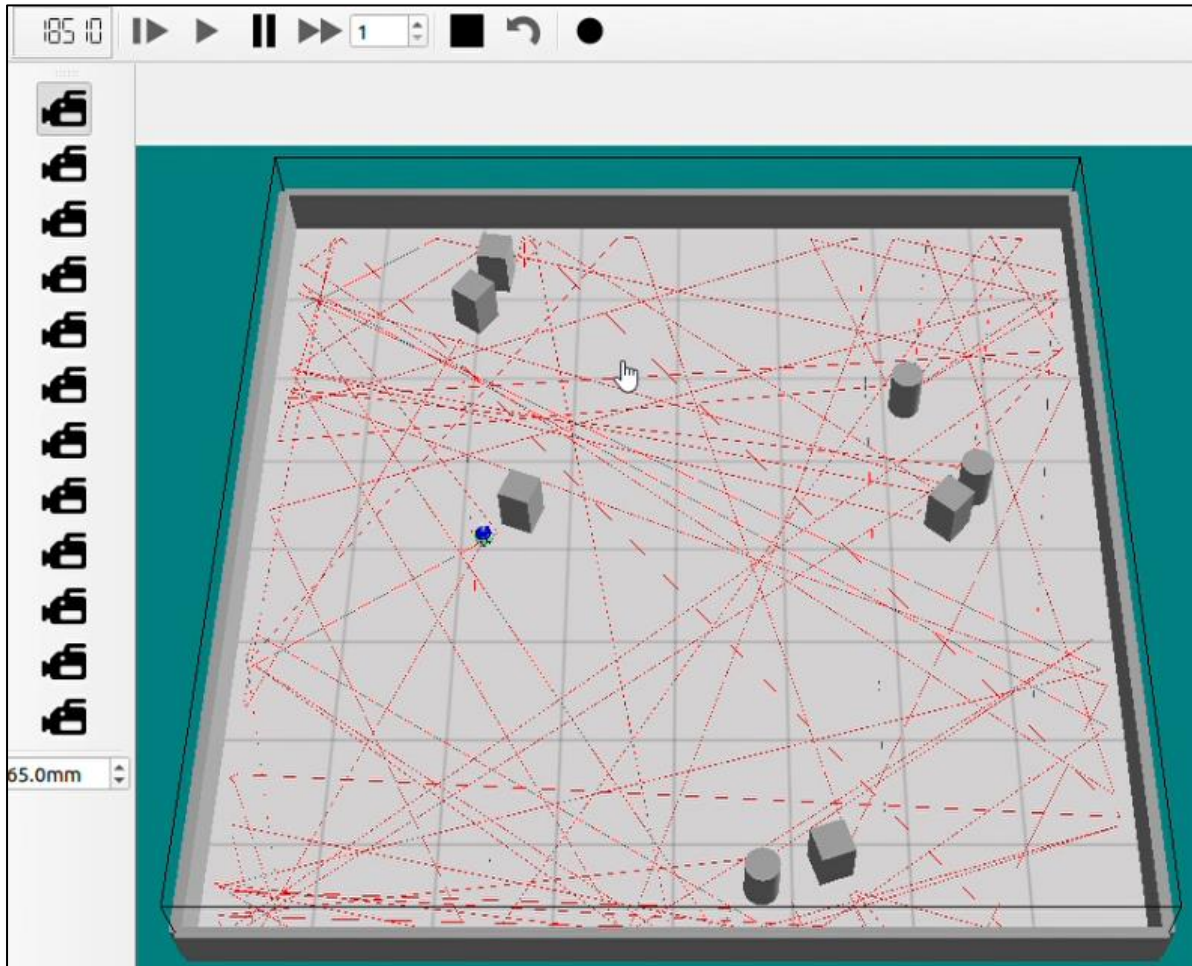
We were more satisfied by the fact that the Krembot found no problem to pass between two adjacent obstacles. Here is a screenshot (from 26,750 clock-ticks):

Success Report for $random\_seed = 3$

End Clock-Ticks: 18,510.

End Screenshot:

Comment: We were less satisfied by this result than previous results because it took more time for the robot to fairly cover the arena. We assume this happened due to the lack of obstacles at the bottom left part of the arena, similar to what happened in experiment number 1.

Success Report for $random\_seed = 4$

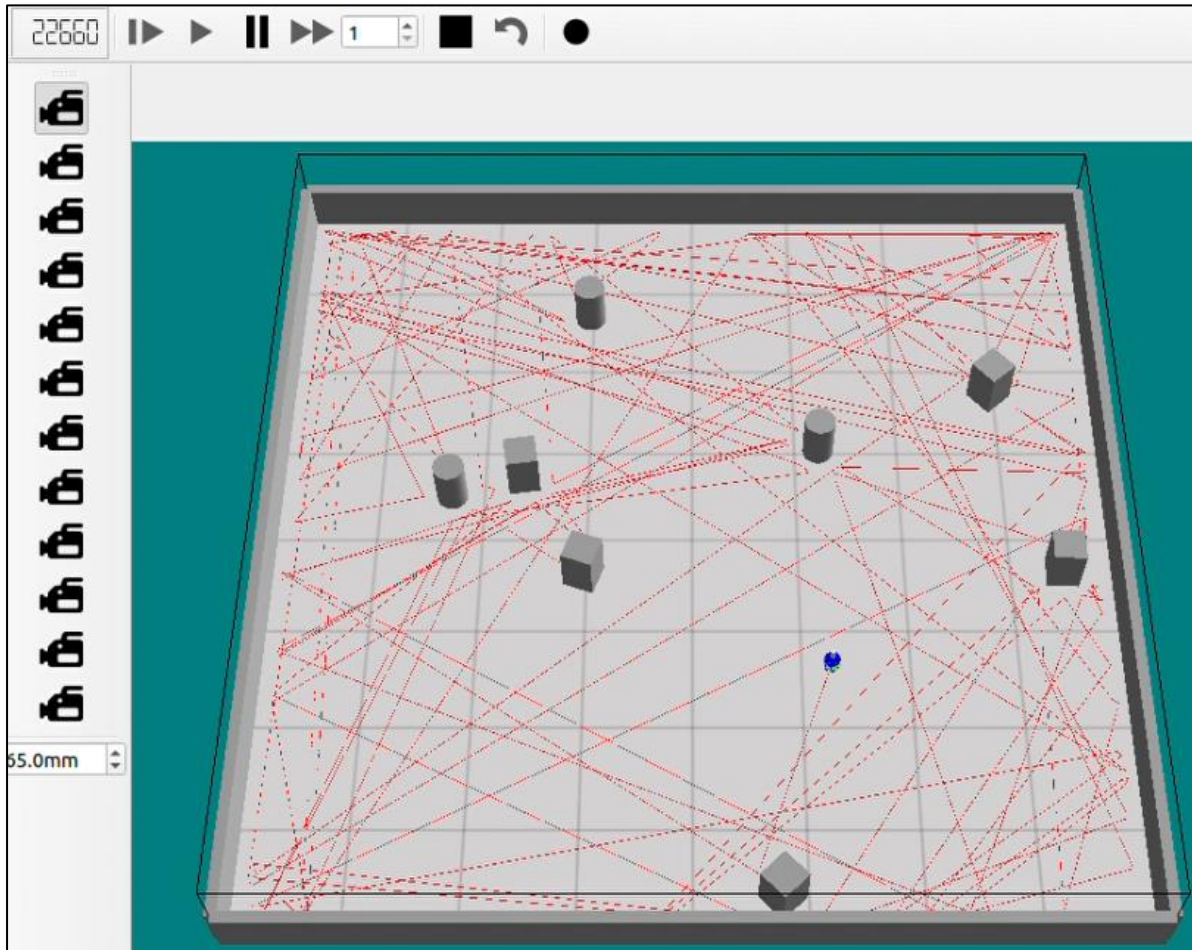<u>End Clock-Ticks</u>: 14,600.

<u>End Screenshot</u>:
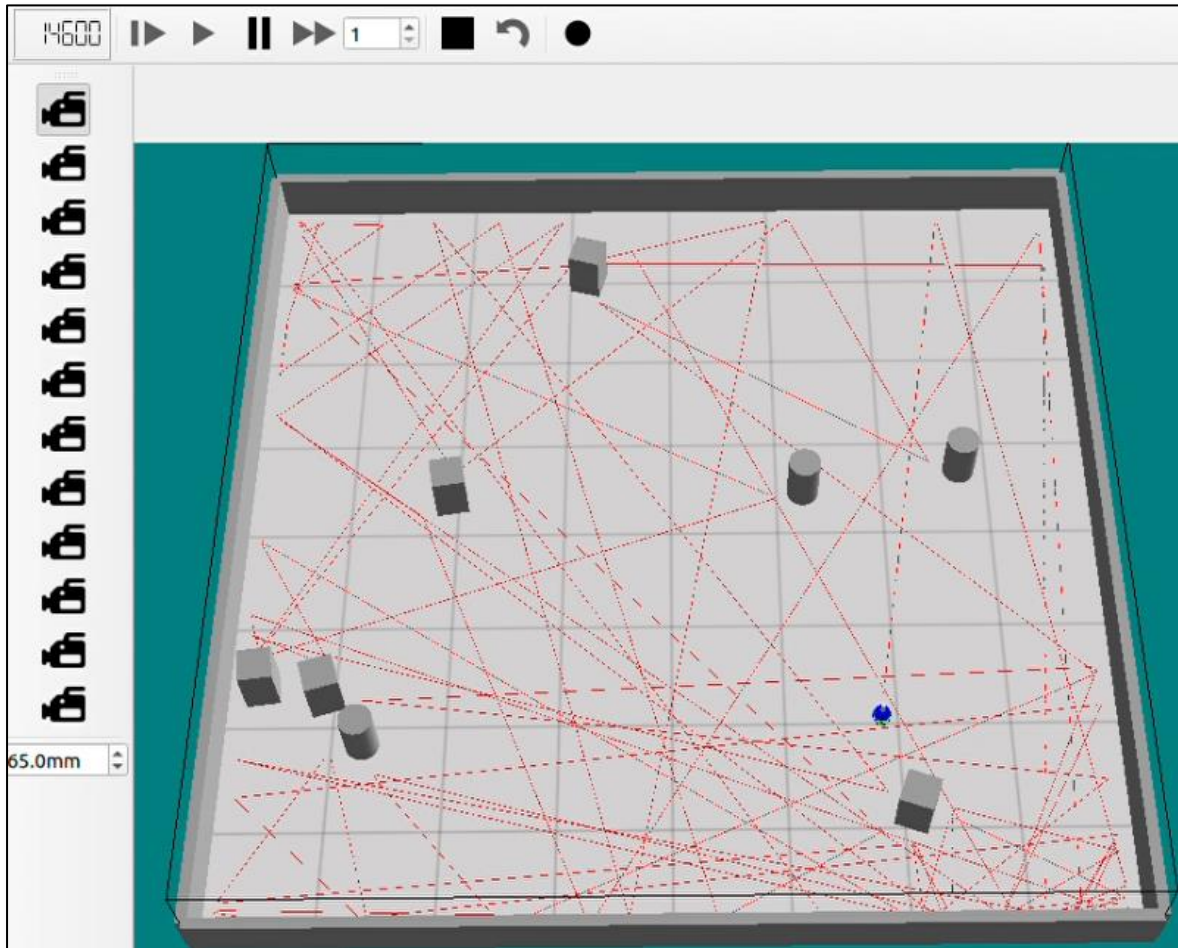
<u>Comment</u>: We are satisfied by this result because it is the best result we had so far. Note that the robot successfully passed through tight passage between the obstacle on the upper part of the arena to the upper wall.

Success Report for $random\_seed = 5$

End Clock-Ticks: 22,660.

End Screenshot:

Comment: This result is acceptable, but we are not really happy with it because it is the worst result from the 5 experiments. We can see how the robot goes over the same lines over and over again and it wastes time. On one hand this can be prevented by changing the angle of motion at random times. On the other hand, we have tried that and in general it didn't yield us a significantly faster performance, so maybe in another run with different random numbers such a case can be avoided.
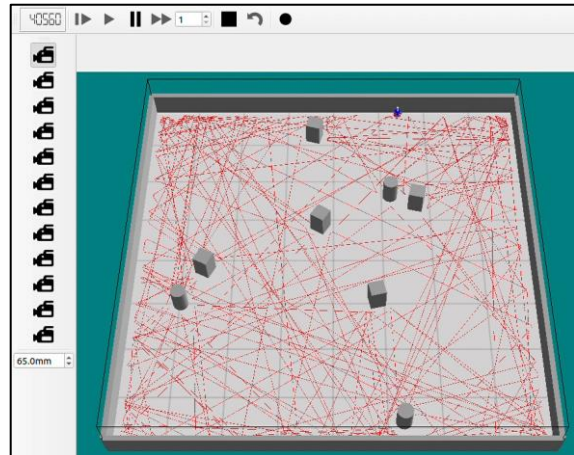
Important Notes

40K Ticks: We ran each test for 1.5 hour (around 40,000 clock ticks) so if the end states we determined to the tests above are not considered as covered enough, here are screenshots from the end of the records:
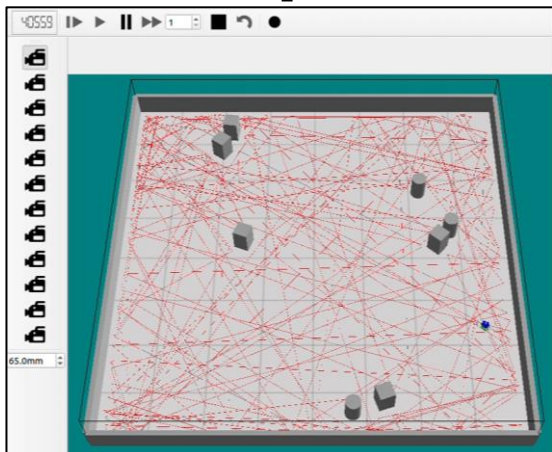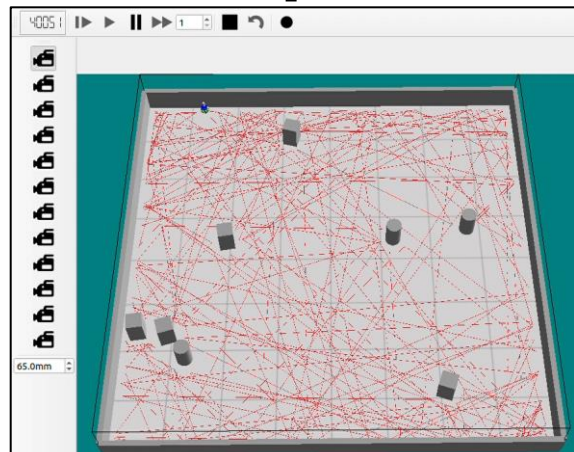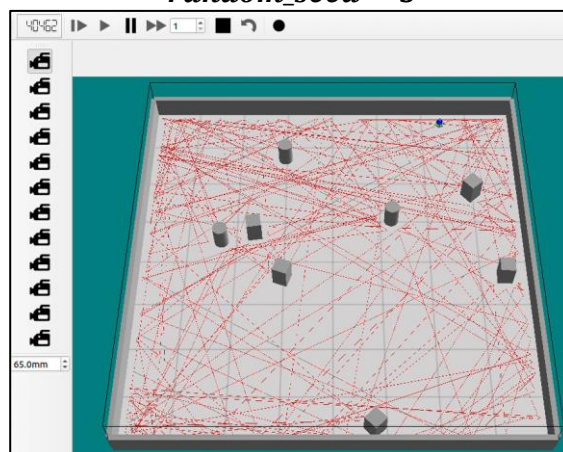
$random\_seed = 1$
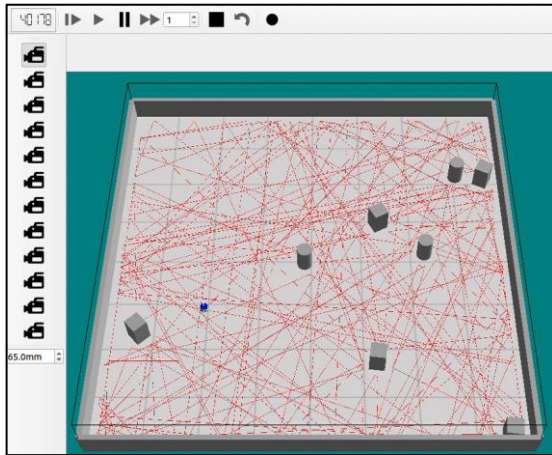
$random\_seed = 2$

$random\_seed = 3$

$random\_seed = 4$

$random\_seed = 5$

Other Techniques: We have tried different techniques such as trying to avoid an obstacle by steering instead of bump and change course, but the results were the Krembot spend a lot of time in the edges of the arena, or the Krembot didn't covered areas around obstacles, and even though we didn't achieve a significantly better times of coverage.